

WHAT IS CLAIMED IS:

1                    1.        A method of preparing a metal surface for formation of a dielectric  
2 barrier layer, the method comprising:  
3                    providing within a processing chamber a substrate bearing a copper layer;  
4                    stabilizing a flow rate of a silicon-containing precursor flowed to an exhaust of  
5 the processing chamber;  
6                    flowing a processing gas into the processing chamber while the flow of the  
7 silicon-containing precursor is stabilized; and  
8                    flowing the stable silicon-containing precursor into the processing chamber to  
9 react with the processing gas to form a silicide layer over the copper layer.

1                    2.        The method of claim 1 wherein:  
2                    stabilizing a flow rate of a silicon precursor comprises stabilizing a flow of  
3 silane; and  
4                    flowing the processing gas comprises flowing ammonia.

1                    3.        The method of claim 2 wherein flowing the processing gas comprises  
2 flowing ammonia mixed with nitrogen.

1                    4.        The method of claim 1 wherein the silicon-containing precursor and  
2 the processing gas are flowed through a common gas supply panel.

1                    5.        The method of claim 4 wherein the silicon-containing precursor is  
2 flowed to the chamber exhaust through a divert line.

1                    6.        The method of claim 1 further comprising forming a dielectric barrier  
2 layer over the silicide layer.

1                    7.        The method of claim 6 wherein forming the dielectric barrier layer  
2 comprises introducing a plasma within the processing chamber.

1                    8.        The method of claim 6 wherein forming the dielectric barrier layer  
2 comprises depositing a barrier layer selected from the group consisting of SiCN, oxygen  
3 doped SiC, SiN, TiN, Ta, TaN, Ta/TaN, BLOK®, and Black Diamond®.

1                   9.       The method of claim 1 wherein stabilizing the flow rate of the silicon-  
2 containing precursor comprises stabilizing the flow of one of silane, tri-methyl silane (TMS),  
3 and dimethyl phenyl silane (DMPS).

1                   10.      A gas supply panel comprising:  
2                   a first mass flow controller configured to be in fluid communication with a  
3 processing gas source through a first inlet;  
4                   a delivery line configured to be in fluid communication with the first mass  
5 flow controller and with a processing chamber through a first outlet;  
6                   a second mass flow controller configured be in fluid communication with a  
7 source of silicon-containing precursor through a second inlet;  
8                   a divert line configured to be in fluid communication with the second mass  
9 flow controller and with a chamber exhaust through a second outlet; and  
10                  a divert valve configured to selectively place the second mass flow controller  
11 in fluid communication with the delivery line or with the divert line.

1                   11.      The gas supply panel of claim 10 wherein the divert valve comprises a  
2 three way valve.

1                   12.      The gas supply panel of claim 10 further comprising a shut off valve in  
2 fluid communication with the second mass flow controller and with the second outlet.

1                   13.      The gas supply panel of claim 10 further comprising a third inlet in  
2 fluid communication with the delivery line through a third mass flow controller.

1                   14.      The gas supply panel of claim 10 wherein the silicon-containing  
2 precursor comprises a liquid, the gas supply panel further comprising:  
3                   an injection valve configured to be in fluid communication with the second  
4 inlet and with the second mass flow controller; and  
5                   a third inlet configured to be in fluid communication with a carrier gas source  
6 and with the injection valve.

1                   15.      A substrate processing apparatus comprising:  
2                   a processing chamber including an exhaust;

3 a gas distribution system configured to receive and deliver gases to a gas  
4 distribution face plate located proximate to a substrate support within the processing  
5 chamber;  
6 a gas supply panel comprising,  
7 a first mass flow controller configured to be in fluid communication  
8 with a processing gas source through a first inlet,  
9 a delivery line configured to be in fluid communication with the first  
10 mass flow controller and with a first outlet,  
11 a second mass flow controller configured be in fluid communication  
12 with a source of silicon-containing precursor through a second inlet,  
13 a divert line configured to be in fluid communication with the second  
14 mass flow controller and with a second outlet, and  
15 a divert valve configured to selectively place the second mass flow  
16 controller in fluid communication with the delivery line or with the divert line;  
17 a first conduit linking the first outlet with the processing chamber; and  
18 a second conduit linking the second outlet with the processing chamber  
19 exhaust.

1 16. The apparatus of claim 15 wherein the divert valve comprises a three  
2 way valve.

1 17. The apparatus of claim 15 further comprising a shut off valve in fluid  
2 communication with the second mass flow controller and with the second outlet.

1 18. The apparatus of claim 15 further comprising a third inlet in fluid  
2 communication with the delivery line through a third mass flow controller.

1 19. The apparatus of claim 15 wherein the silicon-containing precursor  
2 comprises a liquid, the gas supply panel further comprising:  
3 an injection valve configured to be in fluid communication with the second  
4 inlet and with the second mass flow controller; and  
5 a third inlet configured to be in fluid communication with a carrier gas source  
6 and with the injection valve.